DOCUMENT RESUME

ED 402 163 SE 059 204

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TITLE Magical Memories and Rejuvenation through Reflection: Stories of the Development of a Preservice Secondary Science Teacher.
PUB DATE 96
NOTE 22p.; Paper presented at the Annual Meeting of the National Science Teachers Association Southern Area Convention (Atlanta, GA, October 31-November 3, 1996).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Case Studies; Higher Education; *Preservice Teacher Education; Reflective Teaching; *Science Teachers; Secondary Education; Secondary School Science; *Teacher Effectiveness
IDENTIFIERS *Gender Issues; Preservice Teachers

ABSTRACT

This paper invites science teachers to reflect on their own stories of teaching and learning, to build meaning from their personal stories, and to apply their fresh insights to better understand themselves and their teaching. The significance of the research lies in its ability to share authentic stories that represent the experiences of a preservice science teacher. The stories model the critical role of reflection. The paper has been written for (a) preservice science teachers seeking their personal histories in the context of their career goals, (b) practicing science teachers interpreting the themes of their own stories to critically examine their classroom practices, and (c) science teacher educators exploring the relationships among gender, experience, and career aspirations of preservice science teachers. Collaborative work for this paper evolved from an alliance between a beginning science education faculty member and a preservice science teacher. The paper examines the motives and interests of a female preservice science teacher and it contains her autobiographical stories. The themes that emerge from the stories--effective teachers, her own teaching, and gender--are also discussed. Contains 24 references. (Author/JRH)

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MAGICAL MEMORIES AND REJUVENATION THROUGH REFLECTION: STORIES OF THE DEVELOPMENT OF A PRESERVICE SECONDARY SCIENCE TEACHER

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Presented at the annual meeting of the National Science Teachers Association
Southern Area Convention
October 31-November 3, 1996
Atlanta, Georgia

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Purpose

The paper invites science teachers to reflect on their own stories of teaching and learning, to build meaning from their personal stories, and to apply their fresh insights to better understand themselves and their teaching. The significance of the research lies in its ability to share authentic stories that represent the experiences of a preservice science teacher. The stories model the critical role of reflection. The paper has been written for (a) preservice science teachers seeking their personal histories in the context of their career goals, (b) practicing science teachers interpreting the themes of their own stories to critically examine their classroom practices, and (c) science teacher educators exploring the relationships among gender, experience, and career aspirations of preservice science teachers.

Collaborative work evolved from an alliance between a beginning science education faculty member and a preservice science teacher. The paper contains the autobiographical stories of the preservice teacher. Although the first author has written teacher stories collaboratively with practicing science teachers (Robinson, 1995a; Robinson, Schaller, & Viggiano, 1995), the work is unique since it examines the motives and interests of a female preservice science teacher and it contains her autobiographical stories.

Research Questions

The present study is an inquiry into the life history of a preservice science teacher. Based on the autobiographical stories of Tricia, the following questions focus the study.

What are her career and life goals?

What roles will she assume to achieve the goals?

What are her views on gender?

History of the Study

During the first week of the fall 1995 semester, students enrolled in a secondary science methods course described and reflected on class activities and readings. Students kept a weekly reflective journal to record their thoughts about teaching, learning, and science. They also wrote about their prior educational experiences both in and out of science classrooms. Journals were read, discussed with the students, and returned each week of the semester.

This research is based on the reflective journal of one of the students from the methods course. The student, second author of the paper, tells a series of autobiographical stories about the persons and events that have influenced her beliefs about teaching and learning and her career goal of becoming a secondary biology teacher.

Theoretical Perspective

Qualitative research creates transferable, dependable, and confirmable representations of experience. Quantitative parameters used to measure external validity or generalizability, reliability, and objectivity are not relevant in the investigation and were not used. Guba and Lincoln (1989) contrast qualitative and quantitative inquiries by noting that, "the burden of proof for claimed generalizability is on the inquirer [in quantitative studies], while the burden of proof for claimed transferability is on the receiver [in qualitative investigations]" (p. 241). Dependability, another qualitative parameter under the Guba and Lincoln scheme, refers to the stability of data over time. Since the autobiographical stories have been written over a period of several months, the authors suggest that the data are dependable. Rather than seek objectivity as in quantitative studies this work aims for confirmability. The stories are confirmable since the storyteller, Tricia DiNizo, is not only a prime stakeholder in the research but also an author of the research text. The stories have been audited by the principal stakeholder over an extended period of time to ensure authentic representations of her experience that are transferable, dependable, and confirmable.

Story narrative and constructivism are merged so that knowledge is a personal construct of the story themes. In the scope of this paper, constructivism is an epistemology that posits knowledge as a personal construction in a social world. Symbols, for example: language, are used to make and share meaning among a community of knowers (von Glasersfeld, 1989; Cobern, 1993). Knowledge is a personal construct constrained by the narrative shared among members of the community. It is built from experience as individuals use language to assign meanings to actions and events. Meanings of stories are individual constructs built within the cultural context in which they are told. Story is a temporal--with beginning, middle, and end--narrative where a protagonist and other characters interact in a shared place and time. Themes are constructed from the interpretations of the actions and the events in a story. Actions are physical and mental manipulations of things and thoughts. Actions and events are also temporal. Events are unconscious and natural occurrences that are observed. Story is a means of communicating a temporal narrative based on themes (Clandinin & Connelly, 1994).

Humans re-present experience through stories, and they interpret actions through narrative reasoning. Story narratives provide "both a mode of reasoning and a mode of representation" (Richardson, 1990, p. 21). As a mode of representation, stories communicate experience. They allow others to vicariously enter the narrative landscape to witness events and actions in a time and place removed from the present. Story listeners interpret actions and events in the context of a continuum of actions that construct the whole story (Clandinin & Connelly, 1994). The meaning of a story is not the isolated events and actions that construct plot. Rather the meaning connects actions and events into coherent themes (Richardson). Bruner (1986) refers to the implied meaning of a story as, "presupposition, the creation of implicit rather than explicit meanings" (p. 25). Stories unify events and actions, and story themes are interpreted in the cultural context in which the story is told.

Stories are the next best thing to *being there*; stories allow others to share the thoughts and feelings of another. Clandinin and Connelly (1994) note that, "stories are the closest we can come to experience as we and others tell of our experience. A story has a sense of being full, a sense of coming out of a personal and social

history" (p. 415). Yet stories, like other forms of language, do not merely represent experience, they construct it. "Language shapes, focuses, and directs our attention; it transforms our experience in the process of making it public" (Eisner, 1991, p. 28).

Stories are human inventions. They "blur the distinction between fiction and nonfiction" (Robinson, 1995b, p. 38). Constructed from selective memories of recalled pasts and anticipated futures, stories invent experience. Eisner (1991) suggests:

> There is no telling it like it is, for in the telling there is the making. The task is to do justice to the situation and yet recognize that all stories, including those in the natural science, are fabrications--things made. (p. 191)

In the teacher stories *Learning to Teach/Teaching to Learn* edited by Clandinin, Davies, Hogan, and Kennard (1993), one story features a preservice teacher who uses autobiography to examine her relationship with her cooperating teacher. The preservice teacher makes sense of her role by telling a story about her cooperating teacher (Mahabir, 1993). Her story invites readers to reflect on their own experiences and to seek a resonance that links the story to their own pasts (Conle, 1996). Jalongo, Isenberg, and Gerbracht (1995) note that, "Human beings learn from the stories of others to the extent that a particular story causes them to rethink and reexamine their own experience" (p. xx). Stories can be used to help teachers reflect on their own experience as well as the experience of others (Connelly & Clandinin, 1988). A critical examination of autobiographical stories enables teachers to engage in what Schon (1993) calls reflection-on-action. Practitioners who reflect-on-action think about their experiences to make sound professional judgments.

Methods

The story narrative presented in the paper grounds the reflective writings of one preservice teacher who enrolled in a secondary science teaching methods course that I taught at a public college in western New York state. The graduate student (Tricia DiNizo) sought initial teacher certification. She was enrolled in an alternative secondary science program that leads to a masters degree as well as teacher certification.

Tricia's reflective journal molded her autobiographical story writing. At the end of the fall semester, Tricia and I identified themes expressed in her weekly journal entries. Over the next several months she focused her stories on the themes. The themes were (a) the roles of her father, mother, and others considered significant in her decision to pursue a career in secondary science teaching, (b) her own teaching experiences, and (c) her views on gender.

I offered editorial assistance and suggestions during the writing of Tricia's stories. In spite of my comments and suggestions, both Tricia and I believe that her signature, or writing style, has not been compromised. At one point while discussing the meaning of a story, Tricia asked, "If the stories are about me, then how can they be wrong?" I replied that the stories were not wrong, but the meanings were not always clear. Tricia feared losing her

voice in her own stories. It was important to question Tricia about the meanings of her stories; however, it was equally important to listen to her voice. As of this writing, Tricia believes that her voice is present in the stories.

It is possible that by asking Tricia to focus on certain themes in her writings that I have overlooked what she considers significant. Tricia and I spoke about the significant people and events in her life that surfaced in her stories. (Pseudonyms were used to protect the identities of the persons referred to in the paper). Early in the story writing process, I asked her to write about the effective teachers in her life, her own teaching, her views on gender, her reasons for pursuing a career in secondary science teaching, and her beliefs about science and the learning of science. Some of these issues became salient during story rewrites. Although other possible stories and themes were tabled, Tricia believes that the stories told in this paper are significant to her.

Magical Memories And Rejuvenation Through Reflection

A Beginning

I received a profound poem from a friend a few years ago on my birthday. It came to me in the form of a greeting card. The poem reads:

> Go placidly amid the noise and haste and remember what
> peace there may be in silence.
> As far as possible without surrender be on good terms with
> all persons.
> Speak your truth quietly and clearly; listen to others.
> You are a child of the universe, no less than the trees and
> stars; you have a right to be here.
> therefore, be at peace with God, whatever you conceive Him
> to be.
> Whatever your labors and aspirations, in the noisy confusion of life, keep
> pace with your soul.
> With all its sham and drudgery and broken dreams, it is still
> a beautiful world.

The words of the poem inspire me. Looking back on my life the people I respect most are those who emanate a way of life that is dictated by those words. They have conviction; I respect that quality more so than other admirable traits. There are only a few people I can connect with the message of the poem. All of them have taught me about myself.

Reflection

When reflecting on my stories I attain a point of commencement: a foundation that is more supportive of my future goals. Reflection allows me to understand how my experiences influence the way that I think, feel, and interact with others. Reflection has always been a natural process for me. For much of my life I have reflected on a daily basis. In the past, however, I rarely took the time to internalize my experiences and grow from them. The past few years of reflection have been unsettling at times. I enter rocky waters as I struggle to understand myself. Through my stories, I begin to understand my life and who I am.

Reflection is central to my understanding of science teaching. As I think about my role as a student teacher and later as a practicing teacher, many questions fill my mind. How can I activate prior knowledge in the minds of my students and adapt this knowledge to formal science concepts? How can I spark an excitement and passion for the sciences? How will I have my students apply science concepts? These questions imply how I will get others to do something. I believe that I cannot begin to answer these questions until I have a definitive understanding of my own personal experiences and how they have influenced my actions and interactions with others. To better understand these questions, I ask: What life experiences foster my passion for science and teaching? I have discovered some things about myself that I cannot separate from my goals to be the best science teacher that I can be.

One quality necessary in being an effective educator is a strong sense of self; an inner peace so to speak. Those teachers I am thinking of now seem to know who they are in the present, what in the past has led them to where they are, and where they want to be in the future.

When thinking about the traits of an effective teacher, I think of the story of the *Velveteen Rabbit* (Williams, 1983). At one point in the story the Rabbit asks the Skin Horse: What is Real? The Skin Horse responds:

> Real isn't how you are made. It's a thing that happens to you...When you are Real you don't mind being hurt. It doesn't happen all at once. You become. It takes a long time. That's why it doesn't often happen to people who break easily, or have rough edges, or who have to be carefully kept. (pp. 4-5)

My fourth grade elementary school teacher is real. My AP high school biology teacher is real. An African priest who is a friend of my family is real. My mother and father are real. Someday I hope to attain a strong sense of self. Strong enough so that I can be real. The five people mentioned above serve as mentors to me. In my view there is no greater teacher than that of a mentor.

My parents always encourage me to challenge myself. They want me to look beyond boundaries, stretch my talents, explore the unknown, and discover what is out there. These are phrases I heard while growing up. Science has always been a challenge for me. Understanding science, using it, and applying it--stretches the limits of my knowledge.

Many people ask, "Why science teaching?" I struggle to answer. I cannot give a specific answer to their question. There are many stories, one built on the next that explains my chosen career path. I like to challenge myself and teaching science will always be a challenge. I like change and science is always changing. I like trying different things and science lessons can be taught in many different ways. I love learning. There is no better way to

learn something than to teach it. The stories of my life are why I want to teach. The reasons are intricately wrapped up in my upbringing, teachers, friends, and interests.

The following stories examine why I am in the process of becoming a science teacher. In these stories, readers may find some of themselves. Although the names and situations are unique, the themes may not be. The stories touch on my personal relationships, career aspirations, and gender issues that construct who I am today.

Relationships with Real People

My Dad is a high school math teacher. He teaches in a school district across town from where we lived. I remember him coming home from work each night exhausted. He would have the greatest stories to tell about his teaching. He told stories about students, failed lessons, and frustrations with colleagues. His stories intrigued me. Occasionally he would bring home gifts from his students. Sometimes the gifts would be gummy bears; other times bottles of wine. Gratitude in the form of food and drink: they knew my father well.

My dad's students seem to enjoy his teaching. I recall meeting some of his students at a high school track meet. The students exclaimed, "Your father is the best teacher!" This did not surprise me. I always knew my father possessed good teaching attributes. What surprised me were the words they quickly followed with. They said, "Your father is *so* funny!" That blew me away. I rarely saw a funny side to my father. His humor would emerge from time to time in certain social situations, however, these students really made a point of talking about his humor in the classroom. Now that I better understand the realities that he faced I can appreciate why I rarely saw his funny side.

My dad tutored each day after school. He helped prepare students for the SAT to earn extra money. He wouldn't come home until 7, 8, or 9 o'clock in the evening. Weekends were spent teaching a SAT prep course for high school students. There were tough financial times for my family. It is understandable that my dad's humor was depleted when he came home at the end of a long day. Additionally, my father had a history of health problems. The fact that he never felt healthy makes his teaching and parenting all the more admirable. There are four kids in my family and both he and my mother wanted to give us everything our hearts desired.

Knowing the realities of my dad's teaching life made it especially rewarding for me to observe his teaching. As part of my education program at SUNY-Brockport, I have been observing mathematics and science teachers. After watching my dad teach, I finally understood what his students were referring to years earlier at the track meet. He was funny, witty, creative, and so in-tune with his students. The lesson was delivered well, and the students seemed comfortable. There was just the right mix of questions, laughter, seriousness, and involvement. I call his teaching a piece of art.

His lesson was briefly interrupted when a former student came to visit. She had been an exchange student from the year before. She threw her arms around my father and exclaimed that she "had so much to tell him." It was at that time when I realized that my dad may have had four children of his own, but he had thousands in which he had been like a father.

I had few female role models. The gender lines are very distinct in my family. My father is an Italian Catholic, and my mother is an Irish Catholic. Each day dad went to work, and mom stayed home to take care of me

and my brothers and sisters. Dad took care of finances and helped with homework while mom dried the tears and emotionally supported us. It was not until I became older that I would see their roles mesh.

It always bothered me that my mother seemed unhappy at times. I think her unhappiness may have been derived from her inability to live and work separate from the family. Being a successful nurse for many years before raising children had been fulfilling. Yet I believe that if given a chance to do it over again, she would not change any part of her life. Since I saw her unhappiness from an early age, I knew I would do anything to prevent that from happening to me. I wouldn't be dependent on someone else. I believe my mother exchanged her sense of self worth for twenty years of child raising. Even though my dad was overworked, his self image never took a dive. Now I prefer working hard and gaining a positive self image from a career in science teaching. I equate males as strong and confident. I have chosen an alternate path that includes a career yet will not interfere with my desire to raise my own family someday.

Even though male role models had a powerful influence in my family relationships and in my other personal relationships, now I actively seek strong female role models who can be strong intellectually and emotionally. I have discovered the inner strength in my mother who has returned to her career while maintaining close ties with the family. I have also found female friends who have similar needs as I. We encourage one another, discuss our aspirations to achieve success, peace, and balance in our lives. We help each other. This support from other professional women has become a vital source in building my self esteem.

My AP high school biology teacher had a quiet disposition. When I walked into his classroom, I sensed a calmness in the air. His class was challenging for me. During my senior year in high school I was also involved in sports and activities at the school, and I worked two jobs after school and on weekends. I had a hectic schedule. I believed that the more I did, the more I would get done. At the end of typical school day I would go to a meeting, then to track practice, then shower, then off to work until 9 pm. This busy schedule eventually became too demanding. One Friday afternoon at the end of my AP biology class, Mr. Vallee presented an exorbitant amount of work to complete for the following Monday. I became panicked as I considered all of my obligations. After the other students left the room, I sat frozen in my chair. Mr. Vallee noticed my strange behavior and sensed my exhaustion. He asked why I was becoming so distant in the class. I broke down and spilled my guts to him. Eventually I relaxed and told him about my overloaded work schedule. He listened for two hours in his typical calm and cool manner. Mr. Vallee was an important part of my life for a few years after I graduated from high school. I have since learned that he has lived with a brain tumor for eight years but he continues to teach and inspire students.

Mr. Hartz was my fourth grade teacher. On the first day of school, 26 fresh faces walked into his classroom unaware of what the next year held in store. His initial words are as clear to me now as they were on that bright day in 1982. He said:

> For the next 10 months we will journey together. We will learn, we will be confused, we will have fun, and we will fight. Nonetheless, we will all grow together--I as much as you. Think of our classroom as an island--detached from everything else. That being the case, we must all depend on one another and treat one another with the utmost respect.

In that year I experienced all that Mr. Hartz had promised, and I found a life long friend who years later presented me with the Teacher's Association Scholarship. Mr. Hartz taught me that learning can be fun--his integration of games and stories brought a whole new dimension to my life.

There are some people in life that you may not have the opportunity to get to know all that well, but who nonetheless manage to have a profound impact on you. One such person in my life is simply known as Father Mark. He began his American journey in a Catholic parish in New York. Originally from Africa, Fr. Mark had come to New York to work on his doctorate degree at New York University while serving the parishioners at St. Paul. I speak of this man because in spite of the culture shock, language barrier, and loneliness that comes with traveling so far from home, Fr. Mark was able to instantly connect with any person he came into contact with. He did this simply through his honesty and willingness to learn from anything and everything around him. He taught me that learning can come from everywhere however it takes an attuned set of ears, eyes, mind, and heart to look for it, listen to it, absorb it, and make it part of you.

This past summer I met a man who said something to me that truly hit home. He is an extremely intelligent man gifted with the ability to chose his words in such a way that they make difficult things seem easy to understand. We were talking about how we both feel that women are not receiving the equality they deserve. His response to this was, "The only way women will truly be equal is when they believe it as an entire gender, and when they are willing to support and empower one another. The answer is not outside of those parameters. No one will believe it until as a gender you believe it and live it."

Mercury Court Days

Growing up on a street with six other children of my age was key to my development. These children and I competed, fought, explored, played, and challenged one another. Our competition was best displayed through our play--kickball, baseball, running races, other outdoor games. These games allowed us to find out what we excelled in physically and where we fit in socially. Summers were particularly ideal for playing outdoors. I can recall one summer in which we explored the wooded forest behind a playmates house. Every morning we would get up and meet at his house and begin our daily adventure. We pretended to discover a previously untouched land and we played in this land from dawn to dusk. These are my first recollections in exploring nature. We used our surroundings to make forts, cross rivers, and simply enjoy being outdoors in the summer sun.

One summer our creative juices got flowing and we rehearsed and performed the play: Annie. We had auditions for each of the roles, practiced each day, and at the end of the summer, performed our rendition for all our parents and friends. I had the role of little orphan Molly--what a rejection from my peers not to be chosen for the lead. Actually it was a blessing in disguise because I soon discovered that learning how to direct the production was far more interesting than playing the lead.

There were other memories from those summer adventures. Kickball, baseball, relay races, card games, swimming, and bike riding were all part of the outdoor fun. Our minds and bodies were always active. Our group of seven, five girls and two boys, never watched television, played video games, or played with dolls. We needed a

challenge and sitting around passively flipping television stations would never do for our fun. Although we enjoyed one another's company there was a competitive factor among us that kept us driven. This factor was not one of wanting to find a winner and a loser. Rather our play enabled each of us to become winners in our own way. For example, Molly discovered her vocal talents and excelled in this area throughout high school, college, and beyond. Joe discovered that he had a knack for detail, and he is now a micro-chip computer engineer. I discovered that I had an intense curiosity to understand how things work hence I chose to pursue a career in science teaching.

I never played with dolls. My mother recently told me stories of some of the strange things I would do with these toys. If a doll was in my presence I would either beat it up or rip its eyes out. I always had a problem with other girls obsession with dolls and stuffed animals. It wasn't so much that they were playing with them that bothered me, but it didn't seem fair that the boys seemed to have more interesting toys. *Lincoln Logs*, *Legos*, and model airplanes were on my Christmas list. Dolls had no creativity nor challenge for me, I didn't want to be bothered with them. It wasn't long before my parents realized that I had an interest in building things and finding out how things worked. This is the point when they began encouraging me in the sciences. They began this support by providing science books and magazines, taking me to museums, planetariums, and lectures, and entering me in science fairs.

In grade eight I was assigned an independent research project for an English class. I had the opportunity to select my own topic. Many of the other students chose animals, countries, or historical figures. I chose to research the NASA space program. Two weeks into the project the Challenger shuttle blew up. My project took a turn. I decided to research the shuttle and why it malfunctioned. I had to present what I learned to the class. I wanted all of the facts connected to the accident. My class presentation lasted 20 minutes over the allotted time. This was my first formal teaching experience. Since then I have felt empowered to achieve in the sciences.

Undergraduate Days

My undergraduate college days were crazy. The first two years were a roller coaster of experiences and a maze of difficulties. My moods were inconsistent and my goals in life unclear. My source of joy came from my sorority and my biology classes. Everywhere I went and everything I did seemed like a struggle. My classroom experiences did not mean much to me; my professors were distant and seemed disinterested in me. Lectures seemed pointless and a waste of time.

The final two years took a turn for the better. In these years, my real education came from my laboratory and field work. One biology professor became my shining light late in my sophomore year. He took an interest in my curiosity of the natural environment. My college career changed significantly after he encouraged me to research ecosystems. I studied the seasonal impacts on vegetation, invertebrates, and soil textures for a flood plain in western New York. I learned so much in the field, and I had the opportunity to apply my knowledge in what had previously seemed a lifeless and abstract classroom environment.

I managed the Nature and Science department at a county day camp for three consecutive summers during my undergraduate days. It was one of the most rewarding experiences of my life. My goal was to transform my

lessons into games that students would enjoy. The fondest memory I have of that experiences was when I got a number of campers to prefer Nature and Science activities over lunch and swimming. Science-over-swimming-and-lunch is a great complement for a science teacher especially on those warm summer afternoons.

The science activities operated on a minimal budget, so I was creative and stretched the limits of my imagination. I had 300 campers ranging from ages 4 to 12. I learned how to implement similar activities for varying developmental levels. We covered the physics behind bridges, studied the physiology of snails, planted flowers, took nature hikes, studied food webs, became human models of the universe, learned about our senses and organ systems, and conducted soil, plant, and invertebrate sampling.

Another fond memory during my undergraduate days occurred in the Adirondack State Park in upper New York state. I went to the park with my field biology class. We stayed at a biological station and researched many of the different ecosystems in the immediate area. We studied everything from pitcher plants in bogs to oxygen levels in the lakes. We also climbed Mount Algonquin. What mystified and thrilled me most was the change in tree and plant life, temperature, soil texture, and animal life as we climbed the mountain. During the hike, we collected samples of plants and invertebrates, took soil cores, and recorded other environmental conditions. Aside from studying the details of the different ecosystems on our ascent, what struck me most was the distinct beauty in every square inch of the mountain. It was when I reached the top that I realized what true beauty there is in diversity. I intensely wanted to share that experience with others. Someday I hope to take students of my own on a similar hike. When we reached the top of the mountain my professor had each of us collect a rock for ourselves to represent the accomplishment. I now keep that rock on my dresser to signify a promise to share the climb with other future scientists.

Now

I keep a daily journal to record the events of my life. Reflection and actively processing the reflection has become a daily ritual for me. I have a better understanding of myself. I know a little more about how the mentors in my life have influenced me, a little more about what motivates me, and a little more about how my passion for science has formed and developed.

I want to teach science for reasons that are woven into my life. I plan to continue to write my stories since they have been an important reflective tool to help me better understand my ambition to teach science. Someday I hope to write about achieving an inner peace and the role that it plays in influencing my students.

I believe other preservice teachers ought to engage in reflection to better understand themselves. I also encourage veteran science teachers to reflect on their experiences both in and out of the classroom. I am confident that reflection will promote their personal well-being as well as enhance their professional and emotional presence as role models for their students.

Ms. DiNizo writes about the people, actions, and events in her life that have influenced her understanding of science, teaching, and learning. She also explains why she is pursuing a science teaching career. Her story themes are (a) effective teachers, (b) her own teaching, and (c) gender. These three themes are addressed next.

Effective Teachers

Effective teachers have influenced Tricia's beliefs about teaching, learning, and careers. The effective teachers metaphor is Tricia's "personal referent to organize sets of beliefs" (Tobin, 1991, p. 3). In the stories of Tricia, the effective teachers metaphor represents experiences that she fashions into a set of associated beliefs. Tricia's beliefs about effective teachers synthesizes teaching, learning, and science from her experiences with parents, teachers, and clergy.

Tricia equates mentors and effective teachers. Effective teachers are mentors found in the home and the church as well as the classroom. Tricia's ethics mirror the qualities of her mentors thus signifying the profound effect these persons have had in her construction of her own beliefs.

Tricia admires effective teachers since they have conviction for a strong sense of self and an inner peace. In turn, Tricia's conviction, or strong belief, is to find peace within herself, others, and God. She quotes the birthday poem to represent her view of how the lives of effective teachers and her own life ought to be lived. An example of a person with a strong sense of self is Father Mark. He has a calm sense of being that Tricia admires. He is also honest and inquisitive. Tricia is inspired to follow his example to learn the most from her experiences.

Effective teachers are real. The real people in Tricia's life have cared for her and nourished her both emotionally and intellectually. The meaning of *The Velveteen Rabbit* (Williams, 1983) is that care and love makes a thing real. (The story is subtitled: *How Toys Become Real.*) The story portrays how a toy animal becomes real by a child's love. From the story, becoming real is not how a toy is made. Rather it is a process of coming to life through love. Effective teachers are not made instantly. They become real in time as they build caring relationships with others. People, as well as toys, become real through love.

In Tricia's mind, her mother is an effective teacher who is real. Although she is not a classroom teacher, Tricia's mother is a mentor who cares for and loves her children. Tricia's mother interrupts her own career in nursing to care for her children at home.

In making sense of Tricia's meaning of real, it helps to think of the J. D. Salinger (1951) novel: *The Catcher in the Rye*. In the story, Holden Caufield is a troubled youth who refers to insincere people as phonies--the antithesis of real. Holden believes that greed, power, and sex corrupt the actions of phonies. Phony people have not become real. They are insincere, selfish, and arrogant. Phonies do not care nor love others, and Holden does not respect them.

Tricia's effective teachers make personal sacrifices for their students. They put the learning of their students before their own self interests. Tricia writes that her father and Mr. Vallee (AP biology teacher) have medical

problems, yet they continue to work long hours to teach their students mathematics and science, respectively. Tricia's mother also sacrifices for her children. Tricia's beliefs about how effective teachers make sacrifices for their students and children is modeled upon the actions of her mentors.

Effective classroom teachers maintain positive classroom climates (Bellon, Bellon, & Blank, 1992). They do this by infusing humor and calm in their rooms with cooperative students. Tricia writes that her father's students think highly of him because of his ability to make learning fun by injecting humor into the mathematics lessons. Mr. Hartz (grade four teacher) and Mr. Vallee also create positive classroom climates through their classroom actions. Mr. Hartz invites elementary students into a fun, adventurous, and challenging classroom learning environment. A calm classroom atmosphere prevails in Mr. Vallee's AP biology class as students get down to the business of learning science.

Tricia's Teaching

Tricia has been teaching since her childhood on Mercury Court. Even though initially disappointed with not getting the lead role in a neighborhood production of *Annie*, she enjoys directing the cast in the play. This is an opportunity to plan, organize, and direct others to achieve a desired outcome. Directors are teachers who coordinate a cast of players on a stage. Players learn lines, timing, and movements under the supervision of the director. At a young age, Tricia assumes the responsibility of a director that would evolve into a desire to manage secondary science students.

In grade eight, Tricia becomes intrigued with the Challenger disaster. The accident happened while she prepares for a class presentation on the NASA space program. Tricia challenges herself to find out why the accident happened. Her class presentation lasts well over her allotted class time. Teaching thrills Tricia. She enjoys talking to the entire class about the timely topic. In this example, Tricia is thrilled by lecturing in a teacher-centered learning environment.

Tricia's enthusiasm for teaching is implicit throughout her description of the summer nature camp. During nature camp teaching, Tricia describes how she adapts the hands-on science curriculum to teach large groups of diverse age students. She writes that many students forfeit lunches and swim times to attend her supplementary science activities. Conducting hands-on activities in the out-of-doors enables Tricia to generate inquiry lessons premised on students' interests.

Gender

The significance of connectedness in Tricia's life is reminiscent of the writings of Carol Gilligan (1993) concerning the identity and development of girls' voices and Nel Noddings (1992) addressing the role of caring in schools. From Tricia's reflections on the effective teachers in her life, it is not so much what effective teachers do rather it is who they are. The act of teaching is subsumed into the personality of the teacher. Rather than focus on what teachers do in classrooms, her stories highlight the connectedness she feels with them. This connectedness

relates to the development of her own voice. Her voice is heard by teachers who model caring in schools. She perceives a bond of care with effective teachers.

Tricia's beliefs about effective teachers tacitly illuminates the significant role of relationship and connectedness that de-emphasizes her own voice. Gilligan (1993) notes that women's voices have traditionally been silenced because of a conflict between voice and relationship. In a longitudinal study of girls in a midwestern city, adolescent girls began to dissociate themselves from their own voice because of their fear of losing connectedness with others (Brown & Gilligan, 1992). In the preface of the second edition of: *In A Different Voice*, Gilligan (1993) writes, "men and women tacitly collude in not voicing women's experiences and build relationships around a silence that is maintained by men's not knowing their disconnection from women and women's not knowing their dissociation from themselves" (p. xx). Tricia's voice is embedded in the relationships she has had with effective teachers. Her voice is heard through a connectedness with her mentors.

Consistent with the feminist views proposed by Noddings (1992), Tricia believes that effective teachers are care-givers. They selflessly care for others. Tricia has a sense of being cared-for when Mr. Vallee expresses an interest in her problems that constrain her learning. Effective teachers care in spite of financial and physical difficulties.

Tricia writes that as a child she disliked dolls. She preferred toys that could be used to build things. In American culture it is common for young girls to play with dolls in a way that imitates a mother's care for her child. Tricia did not embrace the stereotypical role of mothering dolls. Doll playing was not fun for her. She chose toys to build things in a manner more typical of boy play.

Tricia's search for self understanding is premised on her interpretations of the actions of others. She wants to model her own behavior on the behaviors of her effective teachers. Although Tricia did not imitate a mother role in her toy play, she reproduces her mother's traits. In her own classroom, Tricia wants to be compassionate and sensitive--two of her mother's strongest attributes. Tricia seeks an inner peace; she wishes to better understand herself through reflection. According to Gilligan (1993), Tricia's attempts to understand herself have been traditionally neglected by girls and women. However Tricia's beliefs and actions, like most human beings, does not fit readily into a stereotypical pattern of masculinity or femininity. She seeks to better understand herself--a traditionally masculine trait to search for self understanding (Gilligan). For her it is not simply a matter of seeking to know thyself apart from others. Rather Tricia's search for self understanding is ineluctably linked with others since she seeks connection and relationship. The search for connection is traditionally defined as a feminine trait (Belenky, Clinchy, Goldberger, & Tarule, 1986; Gilligan).

Four of the five mentors in Tricia's life have been males with her mother the exception. Tricia now seeks connections with other females (like she found in Mercury Court Days) in her attempts to better understand herself. She has fostered friendships with other professional women of her own age. Through these friendships she finds support, understanding, acceptance, care, and love.

Tricia's perception of her mother's melancholy links to her own career and family ambitions. She believes that her mother lost a degree of self esteem by becoming dependent upon her father at an early age. Tricia believes

that her mother did not have a strong sense of self while raising children. According to Tricia, the stereotypical role of the stay-at-home-mom would injure her own self esteem at this time in her life.

Tricia viewed her father as a professional role model able to gain self esteem outside of the home. He entered the workplace and returned each night tired but content. Tricia's father provided the financial stability for the entire family to thrive. She believes that her father gained a strong sense of self by interacting with students and others at school. She wants to also gain independence and freedom by becoming a teacher like him.

Tricia would like to blend feminine and masculine traits in her own life. She has noticed a blending of the masculine and feminine roles in her mother since she returned to work health and wellness coordinator. Tricia believes that her mother is gaining a sense of independence and confidence by returning to the workplace. Tricia wants to be a compassionate, care-giver while maintaining a sense of independence and freedom that comes with a career. Tricia has internalized the roles of her father--the provider who found happiness and esteem in his career--and her mother--the care-giver who stayed at home to raise children. Tricia hopes to have the best of both worlds by becoming firmly established in a teaching career before having children.

Synthesis

This paper has been written with the hope that readers will reflect on their own experiences to better understand their teaching practices and theories. Conle (1996) writes that teacher stories create a resonance for the reader/listener. The resonance results from the listener/reader's connection to the emotional quality of the stories. Ms. DiNizo has opened her memoirs in the hope that other science teachers might achieve the resonance and better understand their own experiences. The narrative inquiry is an expression of her experience to facilitate the reader's restoring of their own histories. The synthesis is divided into discussion of research questions, preservice teachers, inservice teachers and teacher educators.

Discussion of Research Questions

What are Tricia's career and life goals?

How feasible is it for a young women to have a successful career and raise children? Tricia is enrolled in a graduate level teacher certification program because she has a goal of earning a secondary science teaching certificate and a masters degree in education. She wants to teach high school science. Tricia also has a goal of having her own children someday. At this time in her life, however, she prefers to focus on her career goals. After teaching for a few years and becoming established in science teaching, she plans on having children. Tricia hopes to take a two year maternity leave from teaching to stay home and give her children a good start in life. Afterwards she will return to her career in science teaching.

On a more abstract level, Tricia's has a goal of gaining a sense of confidence or a strong sense of self. She believes that by combining career and family she will gain self confidence. She also believes that teaching secondary science will help her become real. Tricia has chosen a career in science teaching for two reasons (a) so that she can become real though her interactions with students and others, and (b) so that she can help others become real too.

What roles might Tricia assume to achieve the goals?

Tricia is in the process of becoming a teacher. She is currently enrolled in graduate coursework that will culminate in a masters degree in education. (During the time of this writing, Tricia is student teaching in a public school district in western New York.) In her mind, she is preparing to become an outstanding teacher by reflect on her beliefs about teaching and learning.

What are Tricia's views on gender?

Tricia's views on gender emerge from her descriptions of her mother and her father. She believes that she can combine the masculine traits of career and financial independence and the feminine traits of care, connectedness, and love in her professional and private life.

Tricia's mother took a 20 year leave from her nursing career to stay at home and raise children. She provided a caring and loving environment for Tricia and her siblings to thrive. However, staying at home resulted in lessening her mother's self esteem. She lost herself in her children, and she was unhappy and unfulfilled by not working outside of the home. Alternatively, Tricia's father worked as a high school mathematics teacher. His sense of self was strengthened through his daily interactions with students and other teachers. He was often tired after a long day of teaching, yet he was satisfied and fulfilled in his work.

Preservice Teachers

Reflective journal writing allows students to share what sense they are making of the content knowledge in the context of their own person histories (Loughran, 1996). Preservice teachers may better understand their beliefs about teaching and learning by reflecting on the people, actions, and events that are significant to them. It is recommended that preservice teachers maintain a reflective journal premised on topics like those presented in this paper.

Preservice teachers may model their own memoirs on the examples provided by Tricia. By writing autobiographical stories, Tricia learned about her past as she prepares for a future in science teaching. Her narrative is not only a form of expression but also a form of thinking. The autobiographical stories--a form of narrative inquiry--allow writers to better understand themselves. Tricia is able to organize her thoughts and give meaning to the actions and events in her life that would otherwise slip silently into her stream of consciousness.

Practicing Teachers

Practicing teachers not only have a plethora of classroom experiences from their student days, but they also have a rich knowledge of teaching and learning from their roles as teachers. They can reflect on their on-going experiences as they interact with students. Finding the time to reflect can be problematic given the busy schedules of teachers. However, it is suggested that teachers take time--perhaps 20 minutes--each day to reflect and write or talk with their colleagues about their teaching/learning beliefs. Practicing teachers may also share their journal writings with students. As students read their teacher's narratives, they can be invited into a democratic dialogue that builds mutual trust and respect among students and teachers (Loughran, 1996).

Teacher Educators

Teacher educators' ought to have students engage in reflective journal writing in methods courses. Students, like Tricia, will learn about themselves by examining their own stories about teaching and learning. In turn, instructors will better understand what sense the students are making of the content, and they may also better understand their own beliefs about teaching and learning. Teacher educators can learn about each student from his or her autobiography.

It is recommended that teacher educators better understand their students' perceptions of themselves and the role of gender. Understanding that Tricia is seeking a strong sense of self materialized in her classroom behavior. Compared to the other students in the science methods course, Tricia was reticent in class. Quiet students, like Tricia, need to have classroom environments rich in teacher enthusiasm and care. These students also need environments where the teacher encourages them to ask questions and offer comments and the teacher listens carefully to them.

Implications

Tricia's beliefs about the stoic altruism of effective teachers may disillusion her when she becomes a practicing teacher. At times her stories ring with romanticism that masks richer understandings. For example, Tricia's belief that her father has deeply touched the lives of thousands of students may exaggerate his influence and may set up unrealistic expectations for her own teaching.

Tricia is a 23 year old graduate student poised to begin a career in secondary science teaching. Unlike her mother before her, Tricia has the option of beginning a career and becoming firmly established in it before marriage and children. She plans to postpone having a family of her own until after she becomes financially independent and firmly established in a teaching career. She has a choice that perhaps her mother did not have or desire some 25 years ago.

A gender related issue is the linkage of Tricia's mentors and the role of religion in her life. Tricia's selection of male mentors reproduces the paternalism that exists within Christian doctrine. She describes her mother and father

as being Catholics. Another one of her mentors is a Catholic priest. The religious organization to which Tricia's parents and the priest belong has helped shaped her morals and her image of an omnipotent being. The beliefs, values, and images available to Tricia are premised on her experiences with mentors connected to the Catholic Church. Additionally, the birthday poem received from a friend gives reference to a male god. Using the masculine pronoun to identify god--the embodiment of all that is good and powerful--is male gender bias. In turn, men are more likely than women to be god-like. Females are less significant in cultures equating moral authority and masculinity.

The issue of gender equality is introduced when Tricia offers a quote from a person she describes as an "extremely intelligent man." Tricia shares his belief that women need to support and empower one another. Yet a significant issue for her to consider is that women are not the only sex. They share the gendered landscape with men, and the cultural capital of American society has been and continues to be disproportionately held by men. Therefore it is not simply a matter of women supporting and empowering one another. Rather the disproportionate distribution of cultural capital constrains the opportunities available to women to gain financial and political authority that leads to empowerment.

Final Remarks

Although Tricia's hears her own voice in the stories, Gilligan (1993) notes that someone must listen for a voice to be heard. For me, listening to Tricia's voice means connecting with the tacit meanings found between-the-lines. These include the importance of being cared-for in secondary classroom settings. Hearing her voice means coming to understand her beliefs and how she came to construct them through her interactions with her mentors. It also means trying to find the themes that glue the stories into thematic wholes.

As a teacher educator interested in bringing underrepresented populations into science teaching (i.e. females), I am struck by my resonance with her stories. I can recall times when my stay-at-home-mom seemed to lose her self confidence, and my father seemed to gain a strong sense of self from his work outside of the home. After I left for the university, my mother returned to work, as did Tricia's mother, and she gained or perhaps regained self esteem from her work.

Why does staying at home constrain self confidence for women raising children. Is it that many women (a) lose connection with other adults and feel isolated at home with small children? (b) lose self esteem because they do not earn an income? (c) lose a sense of themselves in the lives of their children? (d) feel left behind as their children mature and eventually leave home? (e) feel helplessly entwined in the needs of the family rather than care for their own personal needs? or (e) feel bored and unwanted in the home? The answers to some or all of the above questions address why some women lose self esteem when they stay at home.

The significant aspect of the stay at home vs. career dilemma is that reflection may foster self understanding and enable female preservice science teachers to design a future that they have designed to meet their own needs. In the 1990s, women like Tricia are delaying child raising until they have achieved financial independence in a career.

The career then family sequence was not as prevalent in the past when women left their homes or college dormitories for their husbands' home and child raising. The social implications of delayed child raising is that some educated women attain more maturity, financial independence, and self confidence before having their own children. They also have an opportunity to return to their careers at an earlier age due to child care, nursery schools, and latchkey programs available today.

I believe that preservice science teachers both male and female may by rejuvenated by reflecting on their own stories. Narrative inquiries of autobiographical stories may transform the experiences of preservice science teachers into magical destinies where they come to better understand themselves and their career goals.

References

Belenky, M. F., Clinchy, B. M., Goldberger, N. R., & Tarule, J. M. (1986). *Women's ways of knowing*. New York: Basic Books.

Bellon, J. J., Bellon, E. C., & Blank, M. A. (1992). *Teaching from a research knowledge base*. New York: Merrill.

Brown, L. M., & Gilligan, C. (1992). *Meeting at the crossroads*. Cambridge, MA: Harvard University Press.

Bruner, J. (1986). *Actual minds, possible worlds*. Cambridge, MA: Harvard University Press.

Clandinin, D. J., & Connelly, F. M. (1994). Personal experience methods. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 413-427). Thousands Oaks, CA: Sage.

Conle, C. (1996). Resonance in preservice teacher inquiry. *American Educational Research Journal, 33*(2), 297-325.

Connelly, F. M., & Clandinin, D. J. (1988). *Teachers as curriculum planners*. New York: Teachers College Press.

Cobern, W. W. (1993). Contextual constructivism: The impact of culture on the learning and teaching of science. In K. Tobin (ed.), *The practice of constructivism in science education* (pp. 51-70). Washington, DC: AAAS Press.

Eisner, E. W. (1991). *The enlightened eye*. New York: Macmillan.

Gilligan, C. (1993). *In a different voice*. Cambridge, MA: Harvard University Press.

Guba, E. G., & Lincoln, Y. S. (1989). *Fourth generation evaluation*. Newbury Park, CA: Sage.

Jalongo, M. R., Isenberg, J. P., & Gerbracht, G. (1995). *Teachers' stories: From personal narrative to professional insight*. San Francisco, CA: Jossey-Bass Inc.

Loughran, J. J. (1996). *Developing reflective practice*. London: Falmer Press.

Mahabir, H. (1993). Autobiography as a way of knowing. In D. J. Clandinin, A. Davies, P. Hogan, & B. Kennard (Eds.), *Learning to teach, teaching to learn*. New York: Teachers College Press.

Noddings, N. (1992). *The challenge to care in schools*. New York: Teachers College Press.

Richardson, L. (1990). *Writing strategies: Reaching diverse audiences*. Newbury Park, CA: Sage.

Robinson, S. D. (1995a). *A narrative of a first year science teacher*. Paper presented at the annual conference of the National Association of Research in Science Teaching, San Francisco, CA.

Robinson, S. D. (1995b). Stories of two high school physics students in the context of their classroom learning environment. (Doctoral dissertation, Florida State University, 1995). *Dissertation Abstracts International, 56*, 11A.

Robinson, S. D., Schaller, J., & Viggiano, E. (1995). A naturalistic inquiry of an adjunct faculty member in a community college science classroom. In D. Waite (Ed.), *Narrative*. Proceedings from the eighth annual conference of the Qualitative Interest Group, Athens, GA.

Salinger, J. D. (1951). *The catcher in the rye*. Boston, MA: Little, Brown and Company.

Schon, D. A. (1983). *The reflective practitioner*. New York: Basic Books.

Tobin, K. G. (1991). *Referents for making sense of teaching*. Paper presented at the annual meeting of the American Educational Research Association.

von Glasersfeld, E. (1989). Cognition, construction of knowledge, and teaching. *Synthese* (80), 121-140.

Williams, M. B. (1983). *The velveteen rabbit*. NY: Holt, Rinehart and Winston.